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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,528	12/28/2005	Xue-Jan Fan	US030215	7980

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EXAMINER	
SMITH, COURTNEY L	

ART UNIT	PAPER NUMBER
2835	

MAIL DATE	DELIVERY MODE
01/16/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,528	FAN ET AL.	
	Examiner	Art Unit	
	COURTNEY SMITH	2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 November 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 1, 7, 12-13** are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)**.

Regarding Claims 1, 12-13 Hagerup discloses a device **(Fig. 4)** for thermal management of an integrated circuit device **(24),** the device comprising: a heat sink **(30);** a substrate **(14)** overlying the heat sink; a trace layer **(26)** overlying and adjacent the substrate; a pad **(where 22 is adjacent and overlies the trace layer)** overlying and adjacent to the trace layer, the pad being operable to mount the IC; and a via **(40)** extending through the substrate, wherein the via is in thermal communication with the trace layer and the heat sink to transfer to the heat sink at least a portion of any heat applied to the trace layer by the semiconductor. **Except, Hagerup** does not explicitly disclose the circuit device is an LED. It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the thermal management device with an integrated circuit chip rather than an LED since it was known in the art that both components are semiconductor devices that produce heat.

Regarding Claim 7, Hagerup discloses a device **(Fig. 4)** of claim 1, wherein the substrate is a flexible substrate **(wherein the disclosed LTCC tape is flexible, as disclosed in Col. 1, lines 40-49).**

3. **Claim 6**, is rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)** as applied to claim 1 above, in view of **(Washburn 5,064,673). Regarding Claim 6, Hagerup** discloses a device **(Fig. 4)** of claim 1, **except** explicitly wherein the substrate is a printed circuit board. However, **Washburn** explicitly discloses a substrate is a printed circuit board **(as set forth by Col. 1, lines 30-34).** It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the substrate of Washburn for a more improved fabrication of electrical connections via trace layers of the printed circuit board between discrete electrical components as opposed to trimming and shaping wire bonded leads etc. **Note: (Background of Invention of Hagerup discloses reference Washburn 5,604,673 (although, *not incorporated explicitly as a reference*).**

4. **Claims 2-5,** are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)** in view of **(Mazzochette 7,095,053)**.
Regarding Claims 2-4, Hagerup discloses a device **(Fig. 4)** of claim 1, **except** explicitly further comprising: a bonding layer between the substrate and the heat sink. However, **Mazzochette** discloses a bonding layer is a thermally conductive adhesive

and/or tape **(Col. 7, lines 4-10; where bonding glasses adhere heat sink 51 and substrate 17 along tape layers)**. It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the thermal management device of Hagerup with the thermally conductive adhesive/tape of Mazzochette for a more improved heat transfer from the substrate for heat radiation by the heat sink.

Regarding Claim 5, Hagerup discloses a device **(Fig. 4)** of claim 2, wherein the substrate is a multi-layered substrate **(as disclosed by Col. 4, lines 62-67).**

5. **Claims 8-11, 14-22,** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hagerup 6,477,054)** as applied to claim 1 above, in view of **(Nakamura 7,054,159) Claims 8-11, 14-17, Hagerup** discloses a device **(Fig. 6)** of claim 1, **except** explicitly disclosing the via includes: a sidewall defining a channel through the substrate, the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink and a thermal conductive material filling at least a portion of the channel. However, **Nakamura** discloses a sidewall **(copper foil--5a-fig. 2)** defining a channel **(5)** through the substrate **(2),** the channel interfacing with the trace layer **(2a, 2b)** to thereby establish the thermal communication between the via, trace layer, and heat sink **(4)** and a thermal conductive material filling at least a portion of the channel **(Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder, since 3a/3b are soldered to the circuit board 2, and Col. 3,**

lines 24-29 further discloses how heat is thus radiated via through hole 5 and 3a/3b). It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the via of Nakamura in order to increase the surface area of the via; wherein allowing for more effective heat transfer and bypassing the circuit board.

Claims 21-22, Hagerup discloses a device **(Fig. 6)** of claim 1, **except** explicitly disclosing the via includes: a copper sidewall defining a channel through the substrate, the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink, a thermal conductive material filling and/or solder at least a portion of the channel; and the thermal conductive material is different from the material of the sidewall. However, **Nakamura** discloses a copper sidewall **(copper foil--5a-fig. 2)** defining a channel **(5)** through the substrate **(2),** the channel interfacing with the trace layer **(2a, 2b)** to thereby establish the thermal communication between the via, trace layer, and heat sink **(4)**, a thermal conductive material filling and/or solder at least a portion of the channel **(Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder since 3a/3b are solder to the circuit board 2, and Col. 3, lines 24-29 further discloses how heat is thus radiated via through hole 5 and 3a/3b);** and the thermal conductive material is different from the material of the sidewall **(as already set forth, whereby the sidewall is portion 5a).** It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the via of

Nakamura in order to increase the surface area of the via; wherein allowing for more effective heat transfer and bypassing the circuit board.

6. **Claim 18-20,** are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Mazzochette 7,095,053)** in view of **(Nakumura 7,054,159).**

Regarding Claims 18-19, Mazzochette discloses a device **(Fig. 6)** for thermal management of an LED **(10),** the device comprising: a heat sink **(51);** a substrate **(17)** overlying the heat sink, a trace layer **(Col. 6, lines 31-35)** overlying the substrate; and a via **(56) except** explicitly disclosing the via includes: a sidewall defining a channel through the substrate, the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink and a thermal conductive material filling at least a portion of the channel. However, **Nakamura** discloses a sidewall **(copper foil--5a-fig. 2)** including defining a channel **(5)** through the substrate **(2),** the channel interfacing with the trace layer **(2a, 2b)** to thereby establish the thermal communication between the via, trace layer, and heat sink **(4)** and a thermal conductive material filling at least a portion of the channel **(Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder, since 3a/3b are soldered to the circuit board 2, and Col. 3, lines 24-29 further discloses how heat is thus radiated via through hole 5 and 3a/3b).** It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Mazzochette with the via of Nakamura in order to increase the surface area of the via; wherein allowing for more effective heat transfer and bypassing the circuit board.

Regarding Claim 20, Mazzochette discloses a device **(Fig. 6)** of claim 18, further comprising: a bonding layer **(bonding glasses—Col. 7, lines 4-10; where bonding glasses adhere heat sink 51 and substrate 17)** between the substrate and the heat sink.

Response to Arguments

Applicant's arguments with respect to claims 1, 12 and 18 have been considered but are moot in view of the new ground(s) of rejection. **Regarding Claim 1, 12, and 18;** the applicant argues that Hagerup does not disclose "a pad overlying and adjacent to the trace layer". The Examiner respectfully disagrees. It is to be noted, as rejected above; a pad 22 overlies and is adjacent to the trace layer 26. Although, the applicant recites the Hagerup's disclosure of the pad 22 in the argument's; the applicant has failed to explain why 22 may not be considered 'a pad'. The Examiner further notes that the applicant asserts no explicit characteristics of 'a pad' that may distinguish the instant application from the prior art, and thus the Examiner relies on common knowledge in the art that an LED may mount a pad which may act as a terminal connection, which is accomplished by Hagerup. The applicant further argues, **in response to Claim 12,** that Hagerup does not disclose 'a flexible substrate'. The Examiner respectfully disagrees. It is to be noted that the applicant's assertion of 'a flexible substrate' does not explicitly denote a substrate is a particular type of flexible material but may rather indicate the

substrate is capable of being flexed as defined by Merriam Webster's Dictionary, and thus the instant application is hereby not distinguished from the prior art. Furthermore, the mere fact as stated by the applicant that the substrate disclosed by Hagerup is flexible but becomes rigid after being heated is not convincing since the substrate is materially a flexible tape and capable of being flexed. **Regarding Claims 2-4;** the applicant argues that the '42-Fig. 4 disclosed by Hagerup is not a bonding layer'. A new rejection has been made using Mazzochette to modify Hagerup and more clearly depict the Examiner's position. **Regarding Claim 6;** a new rejection has been made to better clarify the Examiner's position since the modifying reference is only disclosed in the Background of Invention of Hagerup and not explicitly incorporated as a reference. **Regarding Claims 9, 11, 15, 17, and 19;** the applicant argues that Nakamura does not disclose 'a thermal conductive material filling at least a portion of the channel'. The Examiner has thus made a rejection using a new interpretation to make the record clear.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Courtney L. Smith whose telephone number is 571-272-9094. The examiner can normally be reached on Monday-Friday 7:30a-5p (1st Fri. off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jayprakash Gandhi can be reached on 571-272-3740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/C. L. S./

/Jayprakash N Gandhi/
Supervisory Patent Examiner, Art Unit 2835